

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
30 September 2004 (30.09.2004)

PCT

(10) International Publication Number
WO 2004/084365 A3

(51) International Patent Classification⁷: **H01S 3/067**

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(21) International Application Number:
PCT/GB2004/001034

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(22) International Filing Date: 11 March 2004 (11.03.2004)

(25) Filing Language: English

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(26) Publication Language: English

(30) Priority Data:
0306137.1 18 March 2003 (18.03.2003) GB

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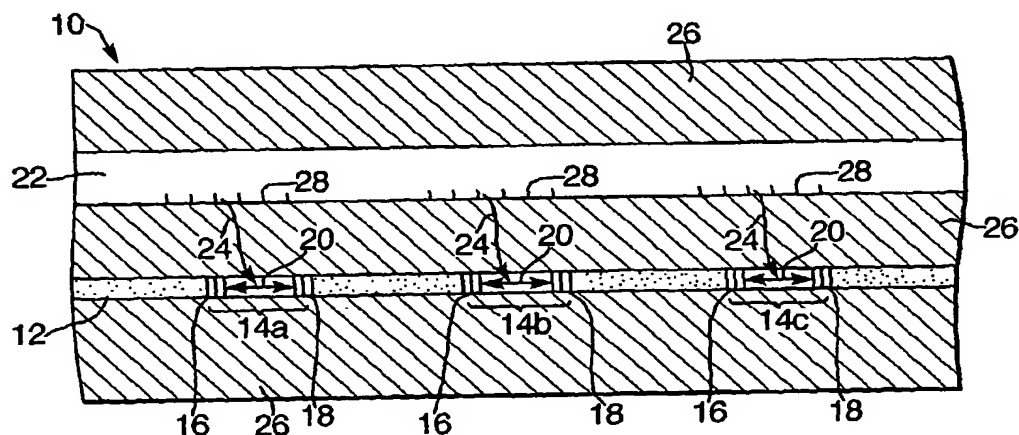
(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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[Continued on next page]

(54) Title: OPTICAL FIBRE



(57) Abstract: This invention relates to optical fibres, fibre lasers, fibre laser arrays and sensor systems comprising fibre laser arrays. Conventional fibre laser sensor arrangements comprise a plurality of fibre lasers arranged in series along a length of optical fibre. A pump light source is located at one end of the fibre and supplies pump light energy to each of the fibre lasers in turn. Such sensor systems experience a number of disadvantages. Firstly, there is an uneven distribution of pump power along the length of the fibre which effectively limits the number of laser devices that can successfully be incorporated into the optical fibre array. Secondly, the manner in which existing sensor systems are constructed often results in back reflections, optical losses and mechanical weaknesses. The present invention provides a fibre laser which mitigates the above problems with fibre laser sensor arrays.



Declaration under Rule 4.17:

— *of inventorship (Rule 4.17(iv)) for US only*

Published:

— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:

3 February 2005

INTERNATIONAL SEARCH REPORT

Int. Application No
PCT/GB2004/001034

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01S3/067

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01S G01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 886 333 A (HICKS JOHN W) 12 December 1989 (1989-12-12)	1, 11, 12
A	column 4, lines 10-35; figure 3 column 5, lines 43-52	2, 10
Y	EP 0 435 217 A (UNITED TECHNOLOGIES CORP) 3 July 1991 (1991-07-03) figures 1, 6, 7	1, 2, 11, 12
Y	PATENT ABSTRACTS OF JAPAN vol. 0134, no. 01 (E-816), 6 September 1989 (1989-09-06) & JP 1 143380 A (FUJIKURA LTD), 5 June 1989 (1989-06-05)	2
A	abstract	1
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☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

29 October 2004

Date of mailing of the international search report

24/11/2004

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International Application No
PCT/GB2004/001034

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 496 303 B1 (FLEMING SIMON CHARLES) 17 December 2002 (2002-12-17) column 3, lines 50-63; figures 3,4	1-12
A	US 5 513 913 A (BALL GARY A ET AL) 7 May 1996 (1996-05-07) cited in the application the whole document	1-12

INTERNATIONAL SEARCH REPORT

Inte 1al Application No
PCT/GB2004/001034

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4886333	A	12-12-1989	US 4730886 A AT 61877 T DE 3678227 D1 EP 0212915 A2	15-03-1988 15-04-1991 25-04-1991 04-03-1987
EP 0435217	A	03-07-1991	DE 69026227 D1 DE 69026227 T2 EP 0435217 A2 JP 3219415 B2 JP 4127591 A JP 2001094178 A US 5317576 A US 5666372 A US 5305335 A US RE35962 E	02-05-1996 29-08-1996 03-07-1991 15-10-2001 28-04-1992 06-04-2001 31-05-1994 09-09-1997 19-04-1994 17-11-1998
JP 1143380	A	05-06-1989	NONE	
US 6496303	B1	17-12-2002	AU 748401 B2 AU 3240699 A WO 9945418 A1 CA 2316862 A1 EP 1060420 A1 JP 2002506281 T	06-06-2002 20-09-1999 10-09-1999 10-09-1999 20-12-2000 26-02-2002
US 5513913	A	07-05-1996	DE 69410595 D1 DE 69410595 T2 DK 681681 T3 EP 0681681 A1 JP 3462212 B2 JP 8506185 T WO 9417366 A1 US 5564832 A	02-07-1998 24-09-1998 12-10-1998 15-11-1995 05-11-2003 02-07-1996 04-08-1994 15-10-1996